

## Claims

[c1] A diffractive optical device comprising

- a transparent support means;
- a volume phase medium attached to said transparent support means;
- a transparent cover means attached to said volume phase medium with a transparent adhesive to provide a sealant and protectant for said volume phase medium;
- the material and geometric parameters of said volume phase medium – the angle of incidence of an incident beam at a nominal wavelength, the angle of diffraction of the diffracted beam at said nominal wavelength, the average bulk refractive index of said volume phase medium at said wavelength, the refractive index modulation of said volume phase medium at said wavelength and the effective thickness of said volume phase medium – being substantially simultaneously established for said incident beam at said nominal wavelength such that the S-polarization diffraction efficiency of said volume phase medium at said wavelength and said angle of incidence and the P-polarization diffraction efficiency of said volume phase medium at said wavelength at said angle of incidence are both substantially maximized at substantially the same value of said index modulation of said volume phase medium of said effective thickness;
- exterior surfaces of said transparent support means and said transparent cover means being coated with anti-reflection coatings such that the Fresnel reflection losses of said exterior surfaces are substantially minimized and the maximum values of said S-polarization diffraction efficiency and said P-polarization diffraction efficiency are substantially equal.

[c2] A volume phase grating as defined in claim 1 wherein said anti-reflection coatings are modified to decrease said S-polarization diffraction efficiency, thereby substantially minimizing the maximum difference between said S-polarization diffraction efficiency and said P-polarization diffraction efficiency across a given bandwidth in a single pass through said grating.

[c3] A volume phase grating as defined in claim 1 wherein a reflective means is used to reflect said diffracted beam back toward said grating.

[c4] A volume phase grating as defined in claim 3 wherein said anti-reflection coatings are modified to decrease said S-polarization diffraction efficiency, thereby substantially minimizing the maximum difference between said S-polarization diffraction efficiency and said P-polarization diffraction efficiency across a given bandwidth in two passes through said grating.

[c5] A diffractive optical device comprising

- a transparent support means;
- a volume phase medium attached to said transparent support means;
- a transparent cover means attached to said volume phase medium with a transparent adhesive to provide a sealant and protectant for said volume phase medium;
- the material and geometric parameters of said volume phase medium – the angle of incidence of an incident beam at a nominal wavelength, the angle of diffraction of the diffracted beam at said nominal wavelength, the average bulk refractive index of said volume phase medium at said wavelength, the refractive index modulation of said volume phase medium at said wavelength and the effective thickness of said volume phase medium – being substantially simultaneously established for said incident beam at said nominal wavelength such that the S-polarization diffraction efficiency of said volume phase medium at said wavelength and said angle of incidence and the P-polarization diffraction efficiency of said volume phase medium at said wavelength at said angle of incidence are both substantially maximized at substantially the same value of said index modulation of said volume phase medium of said effective thickness and the variation of said S-polarization diffraction efficiency with wavelength and said P-polarization diffraction efficiency with wavelength are substantially minimized and the variation of the difference between said S-polarization diffraction efficiency and said P-polarization diffraction with wavelength is substantially minimized;
- exterior surfaces of said transparent support means and said transparent

cover means being coated with anti-reflection coatings such that the Fresnel reflection losses of said exterior surfaces are substantially minimized and the maximum values of said S-polarization diffraction efficiency and said P-polarization diffraction efficiency are substantially equal.

[c6] A volume phase grating as defined in claim 5 wherein said anti-reflection coatings are modified to decrease said S-polarization diffraction efficiency, thereby substantially minimizing the maximum difference between said S-polarization diffraction efficiency and said P-polarization diffraction efficiency across a given bandwidth in a single pass through said grating.

[c7] A volume phase grating as defined in claim 5 wherein a reflective means is used to reflect said diffracted beam back toward said grating.

[c8] A volume phase grating as defined in claim 7 wherein said anti-reflection coatings are modified to decrease said S-polarization diffraction efficiency, thereby substantially minimizing the maximum difference between said S-polarization diffraction efficiency and said P-polarization diffraction efficiency across a given bandwidth in two passes through said grating.